Environmental Health Respective
Vol. 9, p. 139, 1974

Commentary

Microparticles in Biological Tissues*

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It is essential to use an electron beam instrument of scanning or transmission type in investigating microparticles in biological tissues. We have found the transmission type to be more versatile because of its superior resolution and also its ability to give structural and morphological data from any crystalline particles that may be present. Both scanning and transmission types are now readily fitted with energy dispersive and wavelength dispersive x-ray analyzers. The light microscope is useful only for checking preparations before submitting them to electron microscopic (EM) examination.

There are several ways in which one can prepare tissue for EM examination. The most obvious is to cut thin sections, but these are difficult to prepare for good scanning. If tissues contain large numbers of hard particles they are very difficult to cut. A more useful method is digestion of tissue by acid or alkaline agents or by enzyme solutions to produce a concentrate, but digestion involves a number of steps; it is possible that loss of some of the particles and or contamination of the preparation with others may occur. Moreover, digestive procedures usually do not remove all of the organic material, and the residue interferes with the examination. The nature of the specimen may also give problems. For example, in lung specimens from industrial areas we find a lot of associated carbon and this makes scanning very difficult. Some investigators ash their concentrates before finally submitting them to examination.

Direct ashing of tissues can be done in two ways. A gram or two of tissue material may be ashed in an oven and then the residue examined; or a thin section can be ashed on the slide and the residue examined without disturbing its arrangement. Bulk ashing has its problems too. For example, spleen and liver have large quantities of ferritin and hemosiderin particles which clump together and require digestion.

All methods have their drawbacks. Digestion may affect the integrity of mineral particles, and ashing may affect the structural properties of fibers. Several methods should be used if adequate information is desired. One advantage of ashing a section on the slide is that the specimen can be kept for additional examination later as new questions arise and new modes of examination develop.

One thing that we would recommend to anybody entering this particular field is to get a good set of asbestos specimens and develop a good appreciation of the morphology and variation in chemistry that can occur, before undertaking any studies. Looking at mixtures of fibers can become very complicated, and changes do occur in certain fiber types. We have recently completed a small study of the loss of Mg from chrysotile asbestos in the lungs of miners, from animal ingestion, and from intrapleural inoculation. Just the act of EM study may cause a loss of up to half the Mg. With amphiboles, on the other hand, there is very little change in chemistry and identification is relatively straightforward.

*Editor's extract from transcript of presentation.
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